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Preparation and Antibacterial Efficacy of Newly Prepared Algerian Clays Modified With N-Salicylideneaniline

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Abstract

This study explores the synthesis and antibacterial properties of novel Algerian clays modiýed with N-salicylideneaniline. The clay materials were systematically prepared and characterized using various analytical techniques, including X-ray di raction (XRD), Fourier-transform infrared spectroscopy (FTIR), and scanning electron microscopy (SEM). The modiýcation process involved the incorporation of N-salicylideneaniline into the clay matrix, aiming to enhance its antibacterial activity. The antibacterial e cacy of the modiýed clays was evaluated against a panel of pathogenic bacteria, employing standard microbiological techniques. The results demonstrated a signiýcant improvement in antibacterial performance compared to the unmodiýed clays, highlighting the potential of the synthesized materials for applications in antimicrobial formulations and related ýelds. This research contributes to the development of functional clay-based materials with enhanced antibacterial properties, o ering new possibilities for addressing microbial challenges in diverse industrial and healthcare settings.

: Algerian clays; N-salicylideneaniline; Antibacterial e cacy; Clay modi cation; X-ray di raction (XRD); Fourier-transform infrared spectroscopy (FTIR)

Bacterial infections continue to pose signi cant challenges across various industries, necessitating the exploration of innovative materials with enhanced antibacterial properties. Among the materials garnering attention for their potential applications in antimicrobial formulations are clays, owing to their unique structural and surface characteristics. In this context, Algerian clays emerge as promising candidates, o ering abundant natural resources for exploration and modi cation [1]. e utilization of clays in antimicrobial applications has witnessed growing interest, with researchers seeking to enhance their e cacy through strategic modi cations. One such modi cation involves the incorporation of N-salicylideneaniline, a compound known for its antibacterial properties. e synergy between Algerian clays and N-salicylideneaniline presents an intriguing avenue for the development of novel antibacterial agents with broad-spectrum activity.
is study endeavors to contribute to the evolving eld of antimicrobial materials by focusing on the preparation and antibacterial e cacy of newly synthesized Algerian clays modi ed with N-salicylideneaniline.
e choice of Algerian clays stems from their unique mineralogical composition and widespread availability, while the incorporation of N-salicylideneaniline aims to augment their inherent antibacterial potential. rough systematic synthesis and characterization, this research aims to elucidate the structural and surface modi cations imparted by the inclusion of N-salicylideneaniline and assess their

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A noteworthy aspect of this study is the comparison of antibacterial e cacy between modi ed and unmodi ed clays. e substantial enhancement observed in the modi ed clays highlights the pivotal role of N-salicylideneaniline in augmenting the antibacterial potential of Algerian clays. is comparative analysis contributes to a deeper understanding of the impact of modi cation on the antimicrobial properties of clay materials.

e promising results obtained in this study open avenues for the practical applications of modi ed Algerian clays. e enhanced antibacterial e cacy positions these materials as viable candidates for incorporation into antimicrobial formulations in pharmaceuticals, cosmetics, and materials science. Furthermore, the broad-spectrum activity suggests their potential utility in addressing a wide range of bacterial infections.

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While this study provides a comprehensive examination of the synthesized materials, there are opportunities for further exploration. Future research may delve into additional modi cations, optimization of formulations, and in-depth investigations into the mechanisms underlying the antibacterial e ects. Additionally, real-world applications and scalability considerations will be crucial for translating these ndings into practical solutions [7-10].

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In conclusion, the synthesis and characterization of Algerian clays modi ed with N-salicylideneaniline represent a signi cant stride in the pursuit of novel antibacterial materials. is study successfully addressed the objectives of enhancing the antibacterial e cacy of Algerian clays through strategic modi cation, shedding light on the structural changes and antimicrobial potential of the synthesized materials. e structural and surface analyses, including X-ray di raction (XRD), Fourier-transform infrared spectroscopy (FTIR), and scanning electron microscopy (SEM), provided conclusive evidence of the successful incorporation of N-salicylideneaniline into the clay matrix. ese modi cations were accompanied by noticeable changes in crystal structures and morphological characteristics, validating the e ectiveness of the synthesis process. As we consider the promising outcomes of this research, it is essential to acknowledge the need for further exploration. Future studies could delve into additional modi cations, optimization of formulations, and a more in-depth understanding of the mechanisms underlying the antibacterial e ects. Real-world applications and scalability considerations will be pivotal in transitioning these materials from the laboratory to practical solutions that address the pressing challenges posed by bacterial infections. In essence, the synthesized Algerian clays modi ed with N-salicylideneaniline represent a noteworthy contribution to the realm of antimicrobial materials. is research lays the groundwork for continued advancements in the development of e ective antibacterial agents, fostering innovation and progress in the ongoing ght against bacterial infections across diverse sectors.

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References

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